

**Replacement of Single-use Plastics
by Paper Products in Food
Packaging**

By

Dr P.MARIMUTHU

Seshasayee Paper and Boards Ltd

PACKAGING



Requirements in Packaging for food safety

- No hazardous components must touch the food within the packaging,

Food must not change its original appearance and taste.

Should not absorb gas and moisture

Microorganism growth should be controlled.

Must follow FDA regulations

Materials Used for Food Packaging

- **Plastics like Polyethylene- LDPE, HDPE.**
- **Polyvinyl Chloride. ...**
- **Tin. ...**
- **Aluminium. ...**
- **Steel. ...**
- **Cardboard.**
- **Wood**
- **Paper and Paper Board**

PLASTICS

- **Acrylic or Polymethyl Methacrylate (PMMA) ...**
- **Polycarbonate (PC) ...**
- **Polyethylene (PE) ...**
- **Polypropylene (PP) ...**
- **Polystyrene (PS)...**
- **Polyethylene Terephthalate (PETE or PET) ...**
- **Polyvinyl Chloride (PVC) ...**
- **Acrylonitrile-Butadiene-Styrene (ABS)**
- **Ethylene Vinyl alcohol (EVOH)**

Status of Single use plastics

- **Approximately 36 percent of all plastics used in packaging, including single-use plastic products for food and beverage containers, approximately 85 percent of which ends up in landfills or as unregulated waste**

1. Single-use Plastics

- **Straws, beverage bottles, bottle caps Styrofoam cups, and plastic bags are the most common unsustainable and inappropriately disposed of single-use plastics.**

The list of banned Plastic items

The list of banned items includes

Earbuds with plastic sticks,

Plastic sticks for balloons,

Plastic flags, candy sticks, ice- cream sticks,

Polystyrene (Thermocol) for decoration,

Plastic plates, cups, glasses,

Cutlery such as forks, spoons, knives, straw, trays,

Wrapping or packing films around sweet boxes,

Invitation cards, cigarette packets,

Plastic or PVC banners less than 100 microns

PAPER PRODUCTS

Kraft Paper



Glassine Paper



Bleached Paper



Greaseproof Paper



Vegetable Parchment



Whiteboard



Corrugated board



Food board



Carton board



PAPER SURFACE MODIFICATION BY BARRIER COATING

Barrier Coated Flexible Paper Packaging Market: Segmentation

- Coating Type -

- Water-based Coating (Dispersion)
- Solvent-based Coating
 - Wax Coating
 - Extrusion Coating

• Application.

- Packaging
 - Cups & Lids
 - Trays, - Boxes
 - Bags & Pouches
 - Labels, -Blister
 - Wraps

End Use

- Food
 - Bakery
 -
 - Confectionery
 - Snacks
 - Dairy
 - Spices
 - Sauces
 - Beverages

- Cosmetics
- Pharmaceuticals
- Building & Construction
- Electrical & Electronics
- Others (Publications, Automotive, etc.)

PAPER SURFACE MODIFICATION

Barrier Coatings

Barrier coatings form a protective non-porous layer over a substrate that prevents the surrounding environment from affecting the base material.

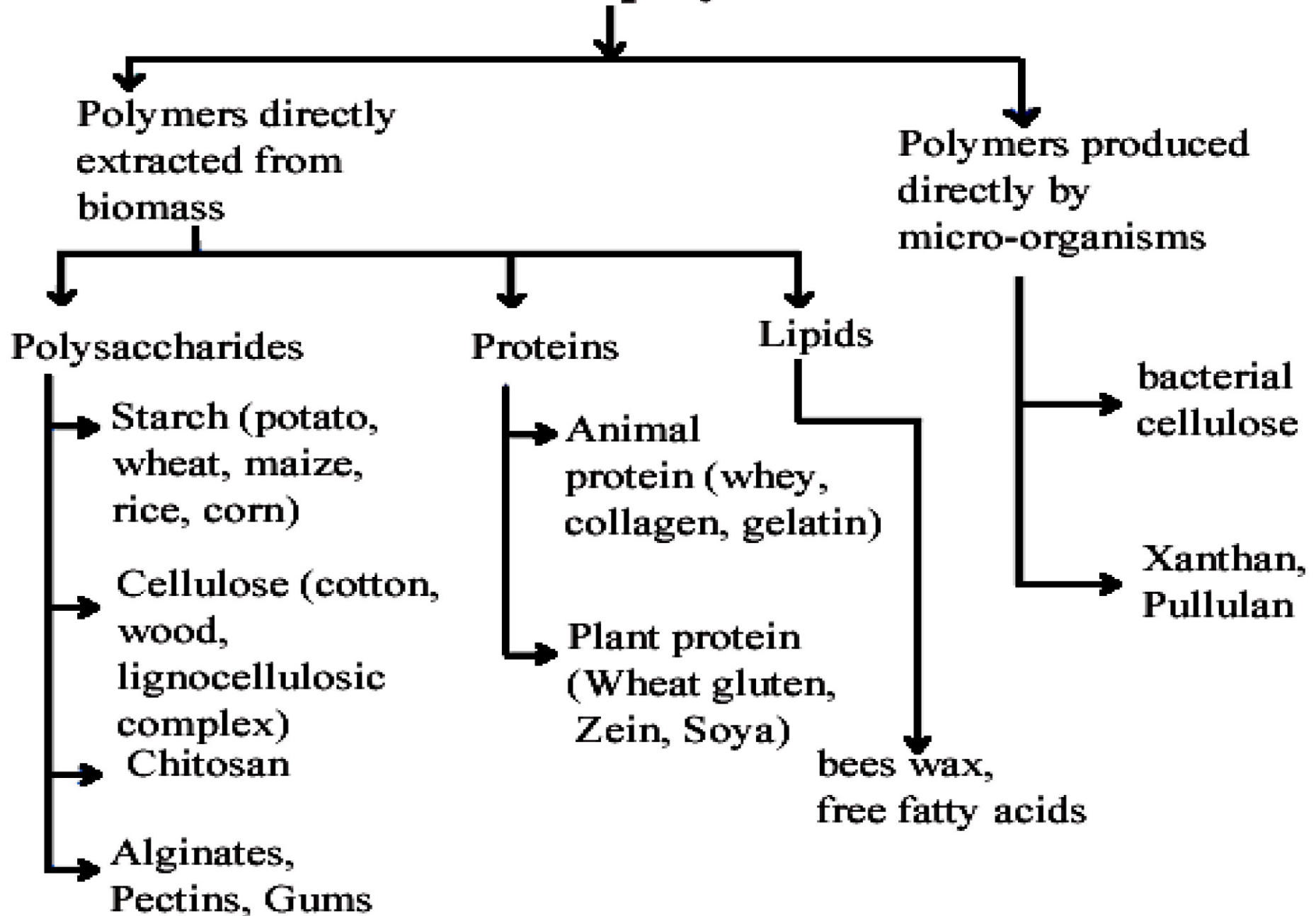
Paper and board are renewable packaging materials, but they don't as such have the needed barrier properties to provide protection against grease, oil, liquid, and other substances. Currently, in many cases, the barrier properties are achieved with extrusion polymers, aluminum, or fluorochemicals.

Barrier Coatings

Packaging boards with waterproof coating are:

- Beverage cups - Serving beverages (Hot /Cold)
- Refill cups - Refilling of water & other beverages
- Ice cream cups - Packaging of ice creams /serving
- Food serving bowls - Serving Gravy food etc.
- Tubs - Serving of Popcorn, fried chicken
- Clamshells - Used for Burgers
- Buckets - Serving oily & fried foods
- Salad trays - Serving salads, sandwiches etc.
- Cake boxes - Cake boxes & Pastries

Bio based polymers



Biosynthetic Polymers

The biodegradable polymers in to two groups and four different families.

- (i) the agro-polymers (polysaccharides, proteins, etc.)
- (ii) the polyesters (biodegradable polyesters) such as polylactic acid (PLA), polyhydroxyalkanoate (PHA), aromatic and aliphatic co-polyesters

Among these polyesters, PLA is at present one of the most promising biopolymers.

Polylactic acid (PLA) is synthetic and aliphatic polyester derived from lactic acid, which is biodegradable by microbes after hydrolysis.

PLANT TRIAL WITH WATER SOLUBLE POLYMERS

WE HAVE CONDUCTED 3 TRIALS FOR 70 GSM TO
ACHIEVE BARRIER PROPERTIES

1. WHILE DOING SINGLE COATING WITH 8 GRAMS, IT GAVE KIT VALUES OF 8, THE SAME WITH DOUBLE COATING GAVE 12.
2. ANOTHER TRIAL WITH 10 GRAMS COATING, PAPER GETS BLOCKING SURFACE
3. AFTER MODIFICATIONS, SAME POLYMER WITH 8 GRAMS GAVE 10 AS KIT VALUE.

Polymers are produced from biosynthesis from Natural sources

Advantages of PLA

Ecofriendly nature,

High availability of raw materials,

Low energy consumption during production,

Biodegradability in both water and soil

PLA is amorphous in nature and has good optical transparency.

Disadvantages of PLA

Poor resistance properties of oxygen permeability (OP) and water vapor permeability (WVP)

PLA

PLA is the best biodegradable and nontoxic polymer with high thermal stability and good mechanical stability.

That is why it is being used for mainly Teacups and ice cream cups through the extrusion coating process.

Now PLA is available as a powder as amorphous in nature or high crystalline form. But the Semicrystalline form will be suitable to achieve barrier properties, particularly for Food packaging.

The oxygen permeability of a material is a function of diffusivity (D) i.e. speed at which oxygen molecules traverse the material.

Polymers are produced from chemical synthesis from biobased monomers

Polyglycolic acid

Polyglycolic acid (PGA) gives excellent barrier properties, and the production of glycolic is through the natural route. The structure of PGA is similar to the PLA, but PGA exhibits higher gas barrier properties with excellent mechanical strength, making it more attractive for packaging applications.

Poly hydroxy alkanates

Biodegradability, inherent hydrophobicity, non-permeability, insolubility, and flexibility made polyhydroxy alkenates (PHA) as a potential competitor for the petroleum-based polymers in the packaging

Polymers are produced from chemical synthesis from biobased monomers

Polybutylene succinate (PBS) is an aliphatic polyester polymer that is versatile and stable in normal conditions. PBS has limitations due to its low elasticity and low gas-barrier properties.

One approach to overcome low elasticity issues is to reinforce PBS with fibers that add structural integrity to the final material.

Conclusion

- **At present perfluoro and polyfluoro alkyl substances commonly referred as PFAS are used to provide grease and moisture resistance in food packaging. These compounds are very persistent both in the Environment and in the human body. Now it is banned in several countries.**
- **Currently many cases, the barrier properties are achieved with extrusion polymers like PLA , and aluminum, which is not in used food packaging.**
- **We need to develop Barrier Coating Formulations to meet the requirements to improve strength, moisture, and oxygen barrier, heat sealability in a cost-effective manner.**
- **In place of the Extrusion coating process, we need dispersion coating form for easy handling.**

Conclusion

- **We work in collaboration with our customers, Converters, Chemical Suppliers and technology providers in the packaging value chain to develop new sustainable, safe, and cost-effective solutions for the current food packaging challenges.**



THANK YOU